FIG. 1

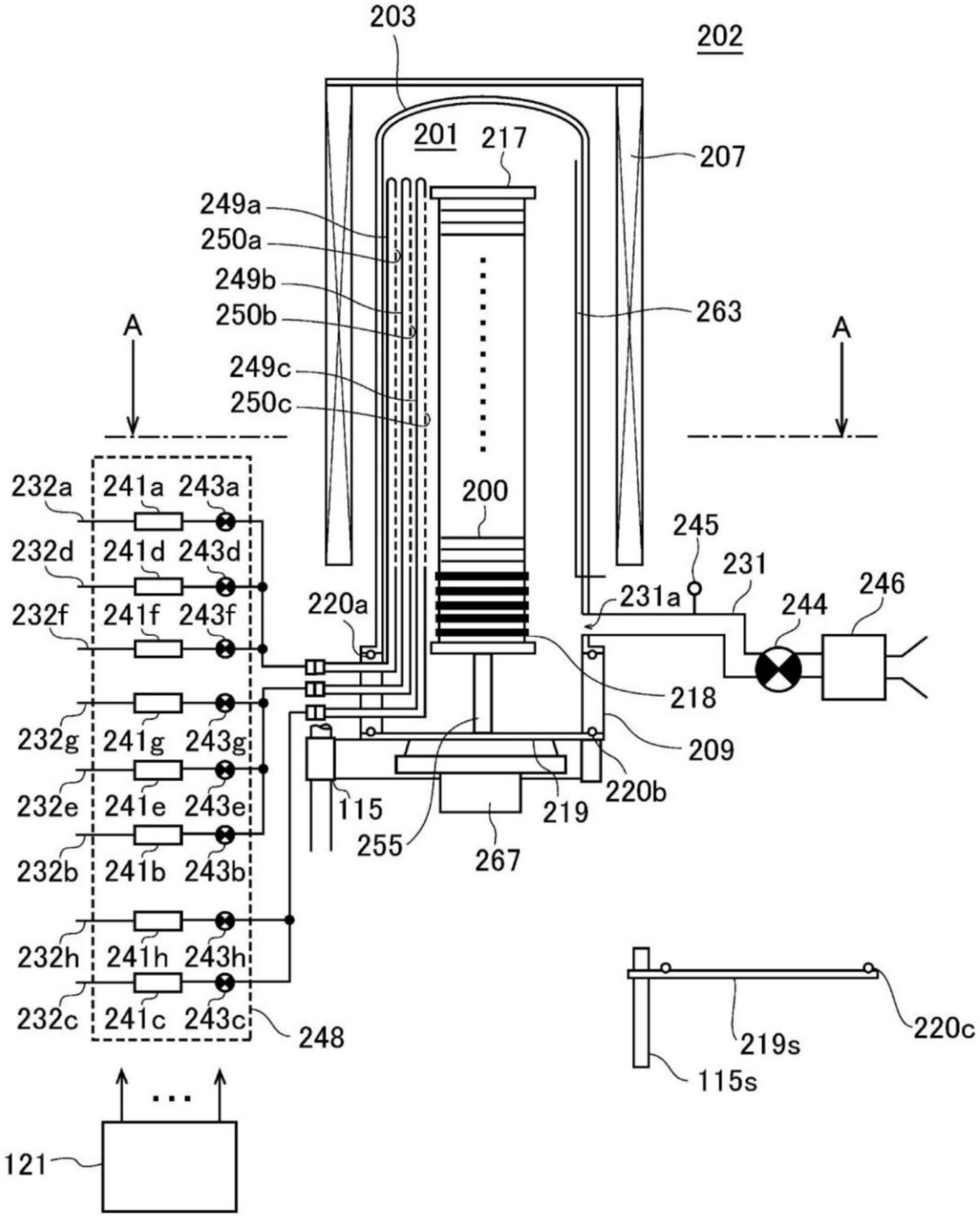

203
202
201
217
207
249a
250a
249b
250b
263
A
A
249c
250c
232a
241a
243a
200
245
232d
241d
243d
231
246
232f
241f
243f
220a
231a
244
218
232g
241g
243g
209
232e
241e
243e
220b
115
219
255
267
232b
241b
243b
232h
241h
243h
232c
241c
243c
248
219s
220c
115s
121

FIG. 2

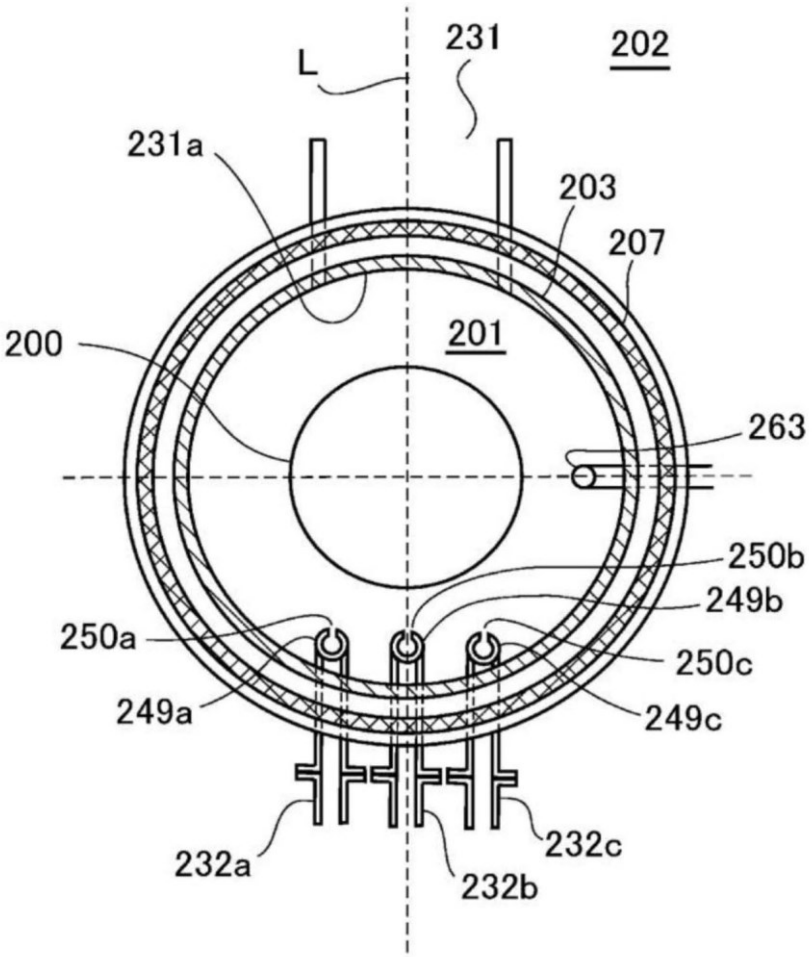

L
231
202
231a
203
207
200
201
263
250b
249b
250a
250c
249a
249c
232a
232b
232c

FIG. 3

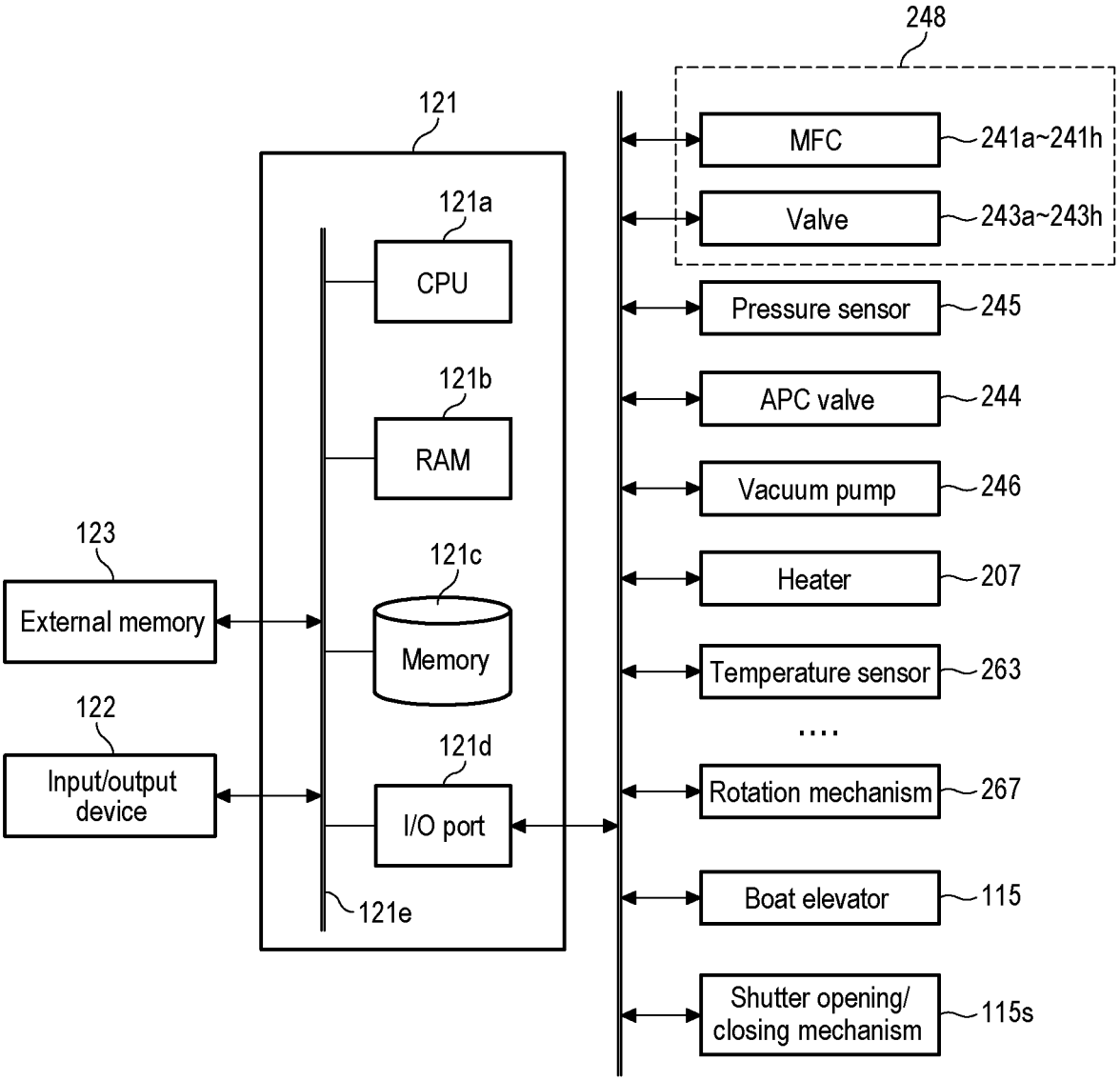

248
121
121a
CPU
121b
RAM
121c
Memory
121d
I/O port
121e
123
External memory
122
Input/output device
MFC
241a~241h
Valve
243a~243h
Pressure sensor
245
APC valve
244
Vacuum pump
246
Heater
207
Temperature sensor
263
....
Rotation mechanism
267
Boat elevator
115
Shutter opening/ closing mechanism
115s

FIG. 4

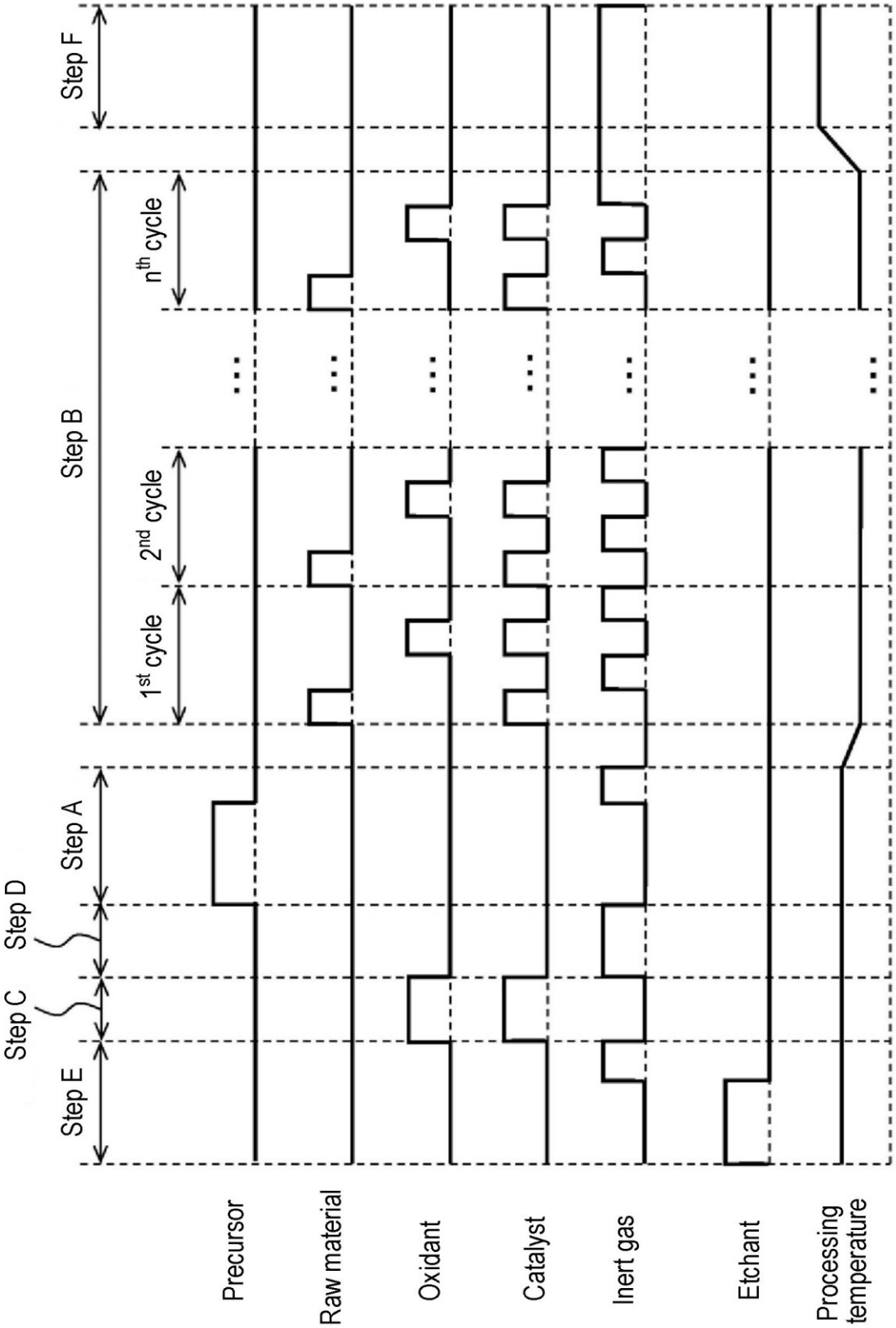

Step A
Step B
Step C
Step D
Step E
Step F
1st cycle
2nd cycle
nth cycle
Precursor
Raw material
Oxidant
Catalyst
Inert gas
Etchant
Processing temperature

FIG. 5A

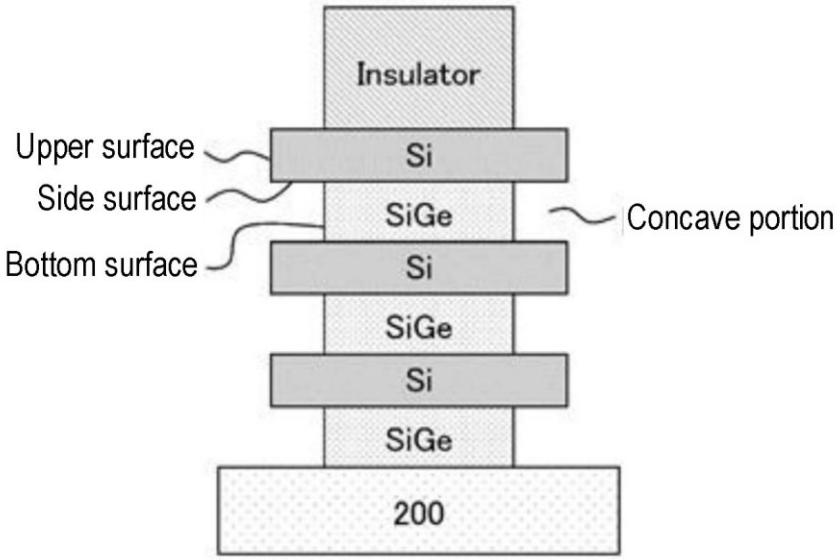

Insulator
Upper surface
Si
Side surface
SiGe
Concave portion
Bottom surface
Si
SiGe
Si
SiGe
200

FIG. 5B

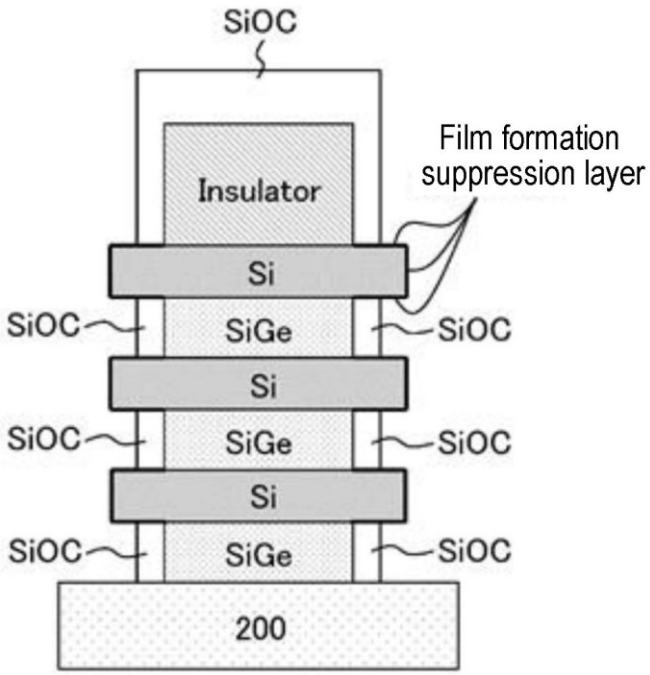

SiOC
Insulator
Film formation
suppression layer
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
200

FIG. 5C

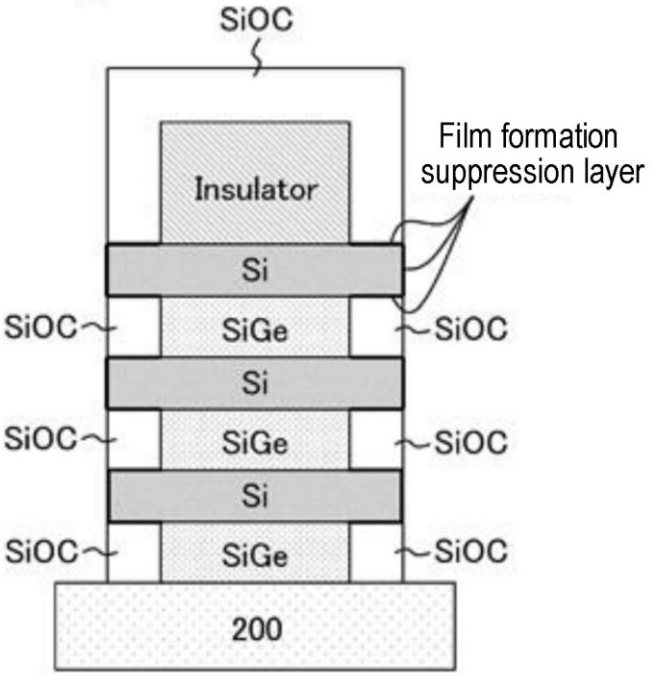

SiOC
Insulator
Film formation suppression layer
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
200

FIG. 5D

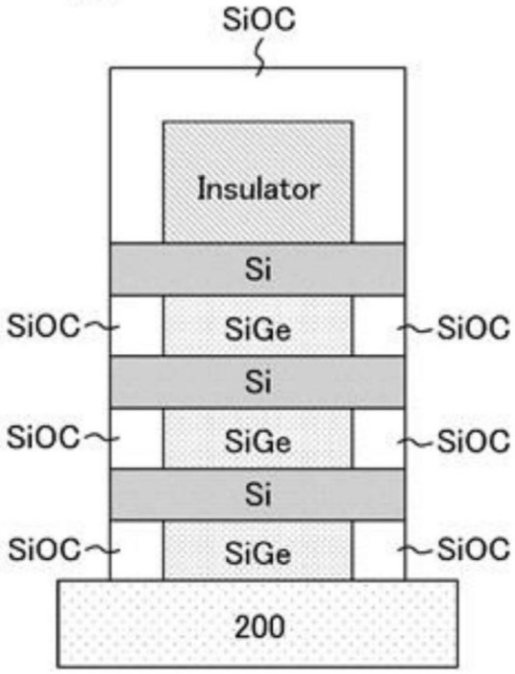

SiOC
Insulator
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
200

FIG. 6A

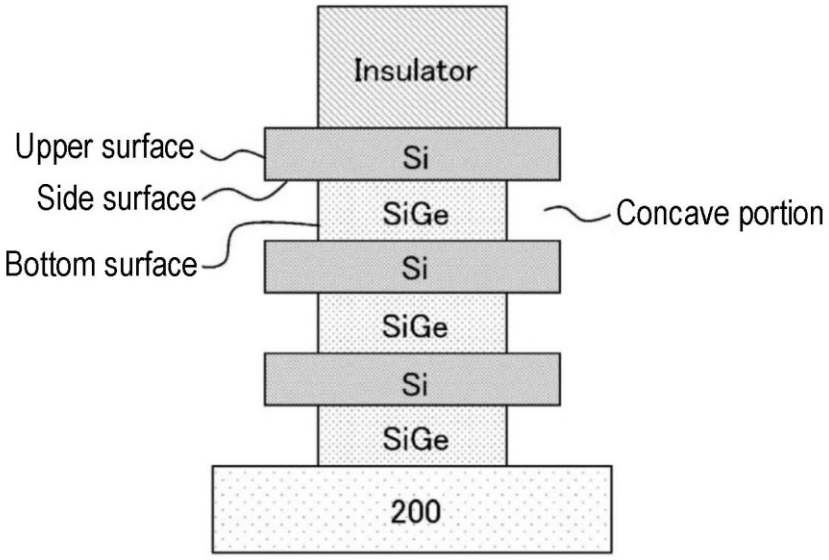

Insulator
Upper surface
Si
Side surface
SiGe
Concave portion
Bottom surface
Si
SiGe
Si
SiGe
200

FIG. 6B

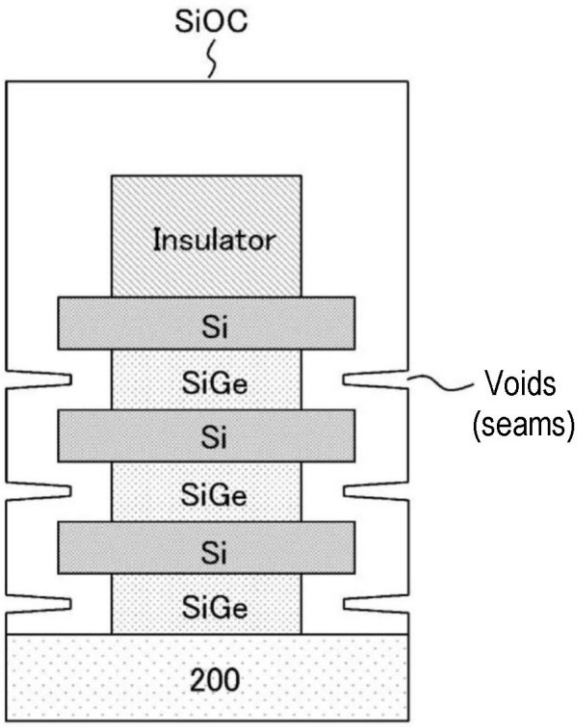


FIG. 6C

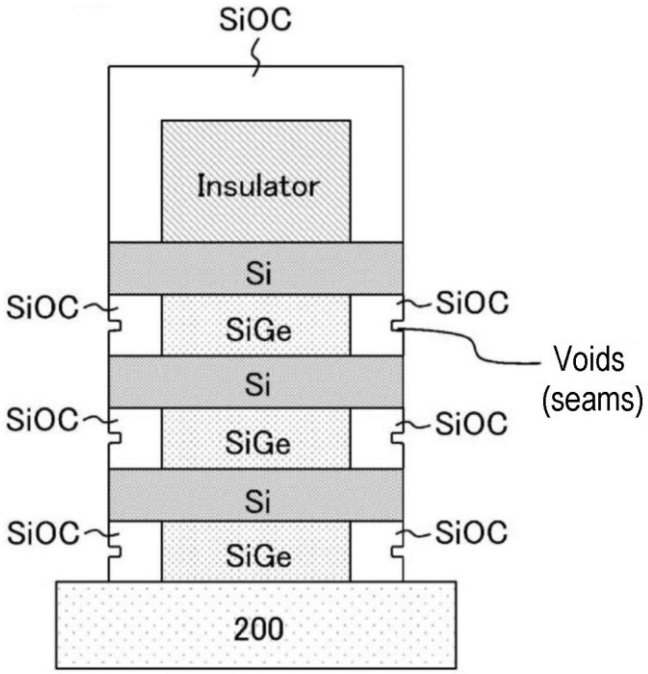

SiOC
Insulator
Si
SiOC
SiGe
SiOC
Voids
(seams)
Si
SiOC
SiGe
SiOC
Si
SiOC
SiGe
SiOC
200

FIG. 7

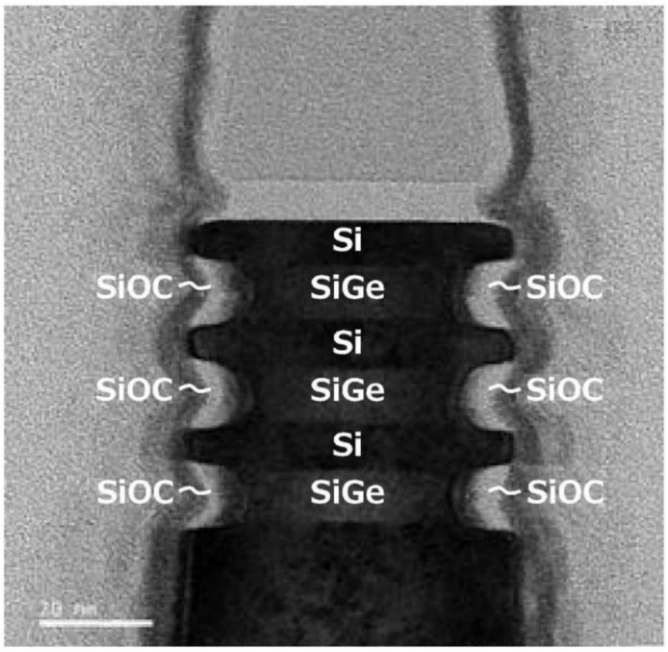


FIG. 8

